



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/619,477	07/19/2000	Shunpei Yamazaki	0756-2178	1881
31780	7590	05/04/2004	EXAMINER	
ERIC ROBINSON PMB 955 21010 SOUTHBANK ST. POTOMAC FALLS, VA 20165			KIELIN, ERIK J	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 05/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/619,477

Applicant(s)

YAMAZAKI, SHUNPEI

Examiner

Erik Kielin

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10, 12-33, 35-44 and 46-56 is/are pending in the application.
- 4a) Of the above claim(s) 1-10, 12-30 and 54 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 31-33, 35-44, 46-53, 55 and 56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 17 March 2004 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims **31-33**, **35-42** and **43**, **44**, **46-53**, **55**, **56** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding independent claims **31** and **43**, and claims **33** and **44**, the specification does not provide support for a second substrate "opposing to said first substrate" having "a second circuit **under** said second substrate" which is connected to the first substrate by the claimed "connecting wiring." See Figs. 12A and 12B. The substrate **250** is not connected to the first substrate by the claimed "connecting wiring." Accordingly, the substrate **250** cannot be the

Art Unit: 2813

substrate referred to in the claims. The only remaining substrate that is not the first substrate is 101 as shown in Fig. 12A which is shown to be connected to the first substrate by the claimed wiring. Accordingly, substrate 101 is the second substrate of the claims. As clearly shown, there exists **no** circuit **under** this substrate; rather, the circuit is **over** the substrate. Accordingly, the independent claims introduce new matter.

The remaining claims are rejected for depending from the above rejected claims.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 31-33, 35, 39, 42, 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,169,593 B1 (**Kanaya et al.**) in view of JP 9-251996 (**Yamazaki et al.**).

Regarding claim 31, **Kanaya** discloses a semiconductor device which is a liquid crystal display --as further limited by instant claim 42-- comprising

a first substrate **20**;

a first circuit comprising a thin film transistor (TFT) formed comprising a semiconductor film (col. 7, lines 40-53; col. 8, lines 43-46) formed over said first substrate;

a second substrate (Fig. 4A called "a driving circuit board **21**" col. 9, lines 17-39) opposing said first substrate **20**;

a second circuit under said second substrate **21**;

Art Unit: 2813

a connecting wiring for electrically connecting said first circuit and said second circuit, said connecting wiring comprising,

a metallic film **22** (gate signal wire; col. 8, lines 25-29) formed over the first substrate **20**; and

a transparent conductive film (TCF) **28** (source signal wire; col. 8, ll. 50-51) over said metallic film **22**; and

a insulating film **24** in contact with a side surface of said metallic film and formed along with a longer side and a shorter side of the metallic film **22**. (See Figs. 2G and 2H; col. 9, ll. 13-40. See also col. 18, ll. 24-51 and Figs. 15A-15B.) Note that the protecting film **24** is the same film insulating between **22** and **28** as shown in Fig. 2F --as further limited by instant claim 32).

In another embodiment as shown in Figs. 7E-7F, **Kanaya** discloses the metal film **26** of about 300 nm (col. 13, lines 37-40) with overlying TCF **28** of a thickness of about 70 nm (col. 9, line 25) --as further limited by instant claim 35-- and protecting film **30** formed of, for example, an acrylic resin and formed along the length and width direction of the lamination film and contacting a side surface of the metal film **26**. (See also col. 14 -- esp. ll. 7-10, 45-67; Figs 12D, 13B.)

Kanaya does not teach that the wiring has a tapered shape.

Yamazaki teaches that contact holes are conventionally required to be tapered to improve the step coverage of upper-layer wiring lines at contact holes (paragraph [0003] first sentence).

Art Unit: 2813

It would have been obvious for one of ordinary skill in the art, at the time of the invention to form the connecting wiring of **Kanaya** to have a tapered shape, as taught in **Yamazaki** because **Yamazaki** teaches that tapering is conventional and required to improve step coverage.

Regarding claim 33, **Kanaya** shows the first and second circuits of the first and second substrates, respectively, are connected via an anisotropic conductive film **80a** (Fig. 2H; also called “output terminal” in Figs. 4A-4B).

Regarding claim 55, **Kanaya** discloses the lamination film is formed of the same materials as the source and drain wiring. (See col. 13, lines 32-36 and especially the paragraph bridging cols. 14-15.)

6. Claims **31-33, 35-37, 42, 55** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,636,329 (**Sukegawa et al**) in view of JP 9-251996 (**Yamazaki et al.**).

The prior art Fig. 2A-2C of **Sukegawa** showing a terminal portion of an LCD display discloses a first substrate **1**;

a first circuit comprising a thin film transistor (TFT) comprising a semiconductor film **4**;

a second substrate (called a “tape carrier package **300** as a driver IC” Fig. 3D; col. 5, lines 27-44) opposing said first substrate **1**;

a second circuit under said second substrate **300** (Fig. 3D);

a connecting wire for electrically connecting said first circuit and said second circuit, said connecting wiring comprising,

a metallic film **7** over said first substrate **1**, and

Art Unit: 2813

a transparent conductive film (TCF) 8 of 40 nm thick (col. 5, lines 6-10) over and in contact with the metallic film surface 7 for connecting said circuit structured with a TFT to another circuit using an anisotropic conductive film (ACF) 10 --as further limited by instant claim 33--;

an insulating film 3 in contact with a side surface of said metallic film 7, wherein said insulating film 7 is formed along with a longer side and a shorter side of the metallic film. (See also col. 3, ll. 9-33 and prior art Figs. 1A-1B.)

Fig. 4A-4B of **Sukegawa** discloses a first substrate 1 having a circuit structured with a thin film transistor (TFT); a second substrate 200 opposing said first substrate 1; a connecting wire formed of a metallic film 7 formed 140 nm thick from Cr, Al, W, etc. (col. 8, ll. 59-63) and a transparent conductive film (TCF) 8 in contact with the metallic film surface for connecting said circuit structured with a TFT (Fig. 3C) to another circuit using an anisotropic conductive film (ACF) 10; and a protecting film 3 in contact with a side surface of said metallic film 7, wherein said connecting wiring and said protecting film 7 are formed over said first substrate 1, and formed along the length direction of the lamination film. Note also that at col. 7, ll. 40-44, **Sukegawa** states, "That is, the upper layer metal wiring 7 is protected at least by double coverage with a transparent conductive film 10 and further protected, locally, by coverage with a protective insulation film 9. (See also col. 3, ll. 9-33 and prior art Figs. 1A-1B.)

Sukegawa does not teach that the wiring has a tapered shape.

Yamazaki teaches that contact holes are conventionally required to be tapered to improve the step coverage of upper-layer wiring lines at contact holes (paragraph [0003] first sentence).

Art Unit: 2813

It would have been obvious for one of ordinary skill in the art, at the time of the invention to form the connecting wiring of **Sukegawa** to have a tapered shape, as taught in **Yamazaki** because **Yamazaki** teaches that tapering is conventional and required to improve step coverage.

Regarding claim 33, **Sukegawa** discloses the connection wiring is connected to a wiring **31a**, **31b** of a third substrate via an anisotropic conductive film (Fig. 3E).

Regarding claim 55, **Sukegawa** discloses the lamination film is formed of the same materials as the source and drain wiring. (See Fig. 3C and associated text.)

7. Claims **31-33**, **35-37**, **39**, **42**, **55** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,608,559 (**Inada et al.**) in view of JP 9-251996 (**Yamazaki et al.**).

The prior art Figs. 1-2 of **Inada**, showing a terminal portion of an LCD panel, discloses a first substrate **221**;

a first circuit comprising a thin film transistor (TFT) comprising a semiconductor film **306** (Fig. 14);

a second substrate **204** opposing said first substrate **221** which is a flexible wiring substrate;

a second circuit **224** under the second substrate;

a connecting wire for electrically connecting said first circuit and said second circuit, said connecting wiring comprising

a 300-nm thick metallic film **209** formed over the first substrate, and

Art Unit: 2813

an 80-nm thick transparent conductive film (TCF) **210** over and in contact with the metallic film surface for connecting said circuit structured with a TFT to another circuit using an anisotropic conductive film (ACF) **211**; and

an insulating film **211** covering a side surface of said metallic film **209**, wherein said insulating film **211** is formed along with a longer side and a shorter side of the metallic film.

(See col. 1, ll. 29-34.)

Fig. 6 of **Inada** discloses a similar embodiment to the prior art figure but shows the protective film **42** of silicon nitride on the side of, and formed along the length and width direction of, the lamination film formed of the 300-nm thick metal film **29** with overlying 80-nm thick transparent conductive film **30** and anisotropic conductive film **36** (col. 8, ll. 50-51). (See also col. 7, ll. 10-30; col. 14, ll. 32-42; col. 4, ll. 24-34).

Inada does not teach that the wiring has a tapered shape.

Yamazaki teaches that contact holes are conventionally required to be tapered to improve the step coverage of upper-layer wiring lines at contact holes (paragraph [0003] first sentence).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to form the connecting wiring of **Inada** to have a tapered shape, as taught in **Yamazaki** because **Yamazaki** teaches that tapering is conventional and required to improve step coverage.

Regarding claim 32, **Inada** discloses that protective film **310** between source/drain wiring is that same as protective film **42** which are each SiN (Fig. 14; col. 14, lines 32-42).

Regarding claim 33, **Inada** discloses the first and second circuits are connected via an anisotropic conductive film **211** (Fig. 2), **36** (Fig. 6).

Art Unit: 2813

Regarding claim 55, **Inada** discloses the lamination film is formed of the same materials as the source and drain wiring. (See Fig. 14 and associated text.)

8. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over any of **Kanaya** in view **Yamazaki**, **Sukegawa** in view **Yamazaki**, and **Inanda** in view **Yamazaki**, each as applied to claim 31 above, and further in view of US 5,821,159 (**Ukita**).

Each of **Kanaya** in view **Yamazaki**, **Sukegawa** in view **Yamazaki**, and **Inanda** in view **Yamazaki**, as explained above, teaches each of the features of the claims except for forming the metallic film as a laminate of tungsten W and tungsten nitride compound WN_x . **Kanaya** does however teach an example of another refractory metallic film as a laminate of tantalum/tantalum nitride or Ta/TaN (col. 17, ll. 44-48).

Ukita discloses that it is known in the LCD art to make a metallic film for an interconnection wiring as a laminate of a tungsten and its nitride (col. 4, lines 21-25). It has been held that selection of a known material based on its suitability for its intended use is *prima facie* obvious. See Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re LESHIN, 125 USPQ 416 (CCPA 1960).

It would have been obvious to one of ordinary skill at the time of the invention to use a tungsten and its nitride to form the metallic film of any of **Kanaya**, **Sukegawa**, and **Inada** as taught in **Ukita** because, in the case of **Kanaya**, **Kanaya** discloses a similar laminate of another refractory metal and because tungsten and its nitride would be expected to work just as well as the other metallic films for interconnect wiring, according to precedent.

Art Unit: 2813

9. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of **Kanaya** in view **Yamazaki**, **Sukegawa** in view **Yamazaki**, and **Inanda** in view **Yamazaki**, each as applied to claim 31 above, and further in view of US 6,215,077 B1 (**Utsumi** et al.).

Each of **Kanaya** in view **Yamazaki**, **Sukegawa** in view **Yamazaki**, and **Inanda** in view **Yamazaki**, as explained above, teaches each of the features of the claims except for forming the transparent conductive film from zinc oxide and compounds of zinc oxide and indium oxide.

Utsumi teaches the benefits of using a laminate of a metallic film 2b, 2c comprising aluminum layer 2b with overlying IZO 2a specifically for use on transparent substrates for LCDs. (See Abstract, col. 2, l. 45 to col. 3, l. 16; and especially col. 4, ll. 49-58.)

It would have been obvious to one of ordinary skill at the time of the invention to use the metallization scheme of **Utsumi** for the reasons in **Utsumi** -- at least to form a metallization free from hillocks which has a low resistance even though it incorporates a conductive metal oxide.

Moreover, it has been held that selection of a known material based on its suitability for its intended use is *prima facie* obvious. See Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re LESHIN, 125 USPQ 416 (CCPA 1960). It would have been obvious to one of ordinary skill at the time of the invention to use zinc oxide or zinc oxide and indium oxide to form the transparent conductive film of any of **Kanaya**, **Sukegawa**, and **Inada** as taught in **Utsumi** because either material would be expected to work just as well as the transparent conductive films of each of **Kanaya**, **Sukegawa**, and **Inada** for interconnect wiring, according to precedent.

Art Unit: 2813

10. Claims **43**, **44**, **46**, **50**, **53**, **56** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kanaya** in view of **Yamazaki** and JP 8-234212 A (**Hioki**).

Kanaya in view of **Yamazaki**, as explained above, teaches each of the features of the claims except for forming column-shaped spacers over the TFTs, wherein the material used to form the spacers is the same material as that used to form the protective film.

Hioki teaches the benefits of forming column-shaped spacers **24** over the TFTs **22** using a resin. It would have been obvious to one of ordinary skill at the time of the invention to form spacers over the TFTs of **Hioki** and form them from resin for the reasons indicated in **Hioki** -- especially because forming the spacers over the TFTs provides uniform light over the pixels.

Because **Kanaya** teaches embodiments wherein the protecting film material is made from resin, both the spacers and the protecting film are formed from the same material.

11. Claims **43**, **44**, **46-48**, **53**, **56** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Sukegawa** in view of **Yamazaki** and **Hioki**.

Sukegawa in view of **Yamazaki**, as explained above, teaches each of the features of the claims except for forming column-shaped spacers over the TFTs, wherein the material used to form the spacers is the same material as that used to form the protective film.

Hioki teaches the benefits of forming column-shaped spacers **24** over the TFTs **22** using a resin. It would have been obvious to one of ordinary skill at the time of the invention to form spacers over the TFTs of **Hioki** and form them from resin for the reasons indicated in **Hioki** -- especially because forming the spacers over the TFTs provides uniform light over the pixels.

Art Unit: 2813

Because **Sukegawa** teaches embodiments wherein the protecting film material is made from resin, both the spacers and the protecting film are formed from the same material.

12. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over any of **Kanaya** in view **Yamazaki** and **Hioki**, **Sukegawa** in view **Yamazaki** and **Hioki**, and **Inanda** in view **Yamazaki** and **Hioki**, each as applied to claim 43 above, and further in view of US 5,821,159 (**Ukita**).

Each of **Kanaya** in view **Yamazaki** and **Hioki**, **Sukegawa** in view **Yamazaki** and **Hioki**, and **Inanda** in view **Yamazaki** and **Hioki**, as explained above, teaches each of the features of the claims except for forming the metallic film as a laminate of tungsten W and tungsten nitride compound WN_x . **Kanaya** does however teach an example of another refractory metallic film as a laminate of tantalum/tantalum nitride or Ta/TaN (col. 17, ll. 44-48).

Ukita discloses that it is known in the LCD art to make a metallic film for an interconnection wiring as a laminate of a tungsten and its nitride (col. 4, lines 21-25). It has been held that selection of a known material based on its suitability for its intended use is *prima facie* obvious. See Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re LESHIN, 125 USPQ 416 (CCPA 1960).

It would have been obvious to one of ordinary skill at the time of the invention to use a tungsten and its nitride to form the metallic film of any of **Kanaya**, **Sukegawa**, and **Inada** as taught in **Ukita** because, in the case of **Kanaya**, **Kanaya** discloses a similar laminate of another refractory metal and because tungsten and its nitride would be expected to work just as well as the other metallic films for interconnect wiring, according to precedent.

13. Claims 51 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of **Kanaya** in view **Yamazaki** and **Hioki**, **Sukegawa** in view **Yamazaki** and **Hioki**, and **Inanda** in view **Yamazaki** and **Hioki**, each as applied to claim 43 above, and further in view of US 6,215,077 B1 (**Utsumi** et al.).

Each of **Kanaya** in view **Yamazaki** and **Hioki**, **Sukegawa** in view **Yamazaki** and **Hioki**, and **Inanda** in view **Yamazaki** and **Hioki**, as explained above, teaches each of the features of the claims except for forming the transparent conductive film from zinc oxide and compounds of zinc oxide and indium oxide.

Utsumi teaches the benefits of using a laminate of a metallic film 2b, 2c comprising aluminum layer 2b with overlying IZO 2a specifically for use on transparent substrates for LCDs. (See Abstract, col. 2, l. 45 to col. 3, l. 16; and especially col. 4, ll. 49-58.)

It would have been obvious to one of ordinary skill at the time of the invention to use the metallization scheme of **Utsumi** for the reasons in **Utsumi** -- at least to form a metallization free from hillocks which has a low resistance even though it incorporates a conductive metal oxide.

Moreover, it has been held that selection of a known material based on its suitability for its intended use is *prima facie* obvious. See Sinclair & Carroll Co., Inc. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See also In re LESHIN, 125 USPQ 416 (CCPA 1960). It would have been obvious to one of ordinary skill at the time of the invention to use zinc oxide or zinc oxide and indium oxide to form the transparent conductive film of any of **Kanaya**, **Sukegawa**, and **Inada** as taught in **Utsumi** because either material would be expected to work

Art Unit: 2813

just as well as the transparent conductive films of each of **Kanaya, Sukegawa, and Inada** for interconnect wiring, according to precedent.

Response to Arguments


14. Applicant's arguments with respect to all pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 571-272-1693. The examiner can normally be reached on 9:00 - 19:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erik Kielin

Primary Examiner

30 April 2004